REMOVABLE ELECTRONICS DEVICE FOR PRE-FABRICATED SENSOR ASSEMBLIES

FIELD

The present disclosure relates generally to electronics devices for interactive objects.

BACKGROUND

An interactive object can include a sensor such as sensing lines which may include conductive threads incorporated into the interactive object to form a sensor such as a capacitive touch sensor that is configured to detect touch input. The interactive object can process the touch input to generate touch data that is useable to initiate functionality locally at the interactive object or at various remote devices that are wirelessly coupled to the interactive object. Interactive objects may include conductive lines for other purposes, such as for strain sensors using conductive threads and for visual interfaces using line optics.

An interactive object may be formed by forming a grid or array of conductive thread woven into an interactive textile, for example. Each conductive thread can include a conductive wire (e.g., a copper wire) that is twisted, braided, or wrapped with one or more flexible threads (e.g., polyester or cotton threads). It may be difficult, however, for traditional sensor designs with such conductive lines to be implemented within objects.

SUMMARY

Aspects and advantages of embodiments of the present disclosure will be set forth in part in the following description, or may be learned from the description, or may be learned through practice of the embodiments.

One example aspect of the present disclosure is directed to a removable electronics device, including one or more processors, a first communication interface configured to communicatively couple the removable electronics device to one or more remote computing devices, and a second communication interface configured to communicatively couple the removable electronics device to at least a first pre-fabricated sensor assembly comprising a first touch sensor having a first set of sensing elements and a second pre-fabricated sensor assembly comprising a second touch sensor having a second set of sensing elements. A first sensor layout of the first set of sensing elements is different from a second sensor layout of the second set of sensing elements. The removable electronics device includes one or more non-transitory computer-readable media that collectively store instructions that, when executed by the one or more processors, cause the one or more processors to perform operations. The operations include analyzing, in response to the removable electronics device being physically coupled to the first pre-fabricated sensor assembly, first touch data associated with the first pre-fabricated sensor assembly to detect one or more pre-defined motions based on one or more first pre-defined parameters associated with the first touch sensor, and analyzing, in response to the removable electronics device being physically coupled to the second pre-fabricated sensor assembly, second touch data associated with the second pre-fabricated sensor assembly to detect the one or more pre-defined motions based on one or more second pre-defined parameters associated with the second touch sensor.

Other example aspects of the present disclosure are directed to systems, apparatus, computer program products (such as tangible, non-transitory computer-readable media but also such as software which is downloadable over a communications network without necessarily being stored in non-transitory form), user interfaces, memory devices, and electronic devices for implementing and utilizing touch sensors such as capacitive touch sensors.

These and other features, aspects and advantages of various embodiments will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the present disclosure and, together with the description, serve to explain the related principles.

BRIEF DESCRIPTION OF THE DRAWINGS

Detailed discussion of embodiments directed to one of ordinary skill in the art are set forth in the specification, which makes reference to the appended figures, in which:

FIG. **1** depicts an example computing environment in which a pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure may be implemented;

FIG. **2** depicts a block diagram of an example computing environment that includes an interactive object in accordance with example embodiments of the present disclosure;

FIG. **3** depicts an example computing environment including a removable electronics device that may be removably coupled to multiple interactive objects in accordance with example embodiments of the present disclosure;

FIGS. **4-8** are various perspective views depicting an example removable electronics device in accordance with example embodiments of the present disclosure

FIGS. **8-9** are top and bottom perspective views, respectively, depicting an example pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure;

FIG. **10** depicts an example layout of a plurality of conductive threads of a capacitive touch sensor in accordance with example embodiments of the present disclosure;

FIGS. **11-13** are various perspective views depicting an example receptacle of a pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure;

FIGS. **14**A-**14**C or perspective views depicting an example receptacle and the insertion of a removable electronics module into the receptacle in accordance with example embodiments of the present disclosure;

FIGS. **15-16** are top and bottom perspective views, respectively, depicting an example pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure;

FIGS. **17-18** are front and side perspective views, respectively, depicting an example receptacle of a pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure;

FIGS. **19**A-**19**C are various perspective views depicting an example of inserting a removable electronics module into a receptacle of a pre-fabricated sensor assembly in accordance with example embodiments of the present disclosure;

FIGS. **20**A-**20**D are perspective views depicting an interactive shoe insert and the insertion of a removable electronics module into a receptacle of the interactive shoe insert in accordance with example embodiments of the present disclosure;